

# PATENT SPECIFICATION

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## (54) A SAFETY AND GUARANTEE CAP FOR SEALING CONTAINERS

(71) WE, SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V., a company organised under the laws of The Netherlands, of 30 Carel van Bylandtlaan, The Hague, The Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:-

The present invention relates to a safety and guarantee cap of elastic, thermoplastic material, intended to provide or complete the closure of a container, for example, a bottle containing a liquid and/or gas under pressure. It applies principally, although it is not limited to this application, to a cap suitable for providing or completing the closure of a container for liquefied petroleum gas (butane or propane), for example, for the closure of a valve outlet connection of a gas bottle.

Such caps are known per se and are most commonly used for the closure of bottles containing aerated beverages, or other similar applications. In one known embodiment, the cap consists of a solid end-plate abutting against the terminal surface of the neck of the bottle, a split flared skirt which projects from this end-plate and surrounds the external wall of the neck and the internal surface of which may be formed to fit the external wall of the neck, and a retaining band which is placed around the skirt during the capping operation so as to press the various sections of the skirt radially against the external wall of the neck and thereafter to keep them elastically applied. The end-plate of the cap itself may be provided with an axial projection of tubular shape which passes inside the neck during capping which improves the tightness of the seal. In one particular embodiment, the retaining band consists of a metal ring or ferrule which is slid axially around the skirt; this provides a

positive locking of the sections of the skirt against the wall of the neck, but a suitable cap-removal tool is required to open the bottle. In another embodiment, the retaining band consists of a thermoplastic material which is considerably more rigid than that used for the manufacture of the cap, and includes a grip tag to facilitate extraction of the band for cap removal; this band may advantageously be provided with notches which constitute fracture zones, facilitating tearing for the purposes of cap removal; apart from the fact that such a band may only be used once, this form of construction suffers from the disadvantage that two parts of different types have to be produced for each cap.

The present invention provides an improved cap of the type described above, which can make manufacture more economic, and/or can allow a higher rate of capping (using high-speed machinery), and/or can improve reliability at relatively high internal pressures (of the order of 20 bar, for example), and/or can render unauthorized removal detectable, whilst permitting re-use of the cap.

According to the present invention there is provided a safety and guarantee cap of elastic, thermoplastic material suitable for providing or completing the closure of a container for a liquid and/or gas under pressure for example, said cap consisting of a solid end-plate adapted to abut against the terminal surface of the opening to be sealed, a split-flared skirt which projects from this end-plate and is adapted to surround the external wall of said opening, its internal surface being formed to fit the shape of said wall, and a retaining band which is adapted to slide axially along the skirt and to hold the various sections of the skirt elastically and radially pressed against said wall, wherein (1) the retaining band is moulded integrally with the end-plate of the cap, to which it is

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attached by narrow webs of material defining a plurality of circumferential slits between the end-plate and the band, whereby said retaining band can be detached from said end plate by tearing the webs by movement of a fitting tool, and (2) the internal surface of the end-plate of the cap, in relation to the container opening, is provided either with a central boss approximately in the shape of a spherical dome, the diameter of the base of which corresponds substantially to the internal diameter of the opening to be sealed, or with an axial projection of tubular shape which is adapted to enter the opening to be sealed.

Advantageously, the cap is provided adjacent to the extremity of the skirt with a groove in which the axially movable retaining band is adapted to engage the depth of said groove being sufficient to ensure positive location of said band therein.

The cap can have a retaining band which consists of two co-axial rings joined together by a solid area over part of the circumference and otherwise separated by a narrow circular slit such that the outer ring alone can be raised above the common plane to serve as a grip loop, such a loop facilitates removal of the retaining-band assembly when the cap is taken off. The two coaxial rings are preferably further joined together by one or more webs of material distributed along the circular separation slit, it being necessary to tear the said web or webs of material to lift the outer ring. Such tearing provides evidence of any unauthorized cap removal.

The present invention will be described with reference to the accompanying drawing in which:

Figure 1 is an end view of a cap according to the invention, before use;

Figure 2 is a view in perspective of the same cap, likewise before use;

Figure 3 shows the same cap when fitted, with the outer ring of the retaining band raised for cap removal;

Figures 4 and 5 are axial cross-sections of two different forms of the cap in accordance with the invention, at the beginning and end of the cap-fitting operation, respectively.

The cap shown in the accompanying drawing, which is made of elastic, thermoplastic material and is intended for completing the closure of bottles containing liquefied petroleum gases, consists of a relatively thick solid end-plate 1 and a flared skirt 2 which is uniformly divided by longitudinal slits into a number of sections flexibly attached to the end-plate 1. The internal wall of the various sections of the skirt 2 is preferably provided with circular ribs or other projections in patterns matching those provided on the external wall of the opening to be sealed, i.e. the valve outlet connection of a bottle of liquefied gas. The

cap comprises a retaining band generally designated by the reference numeral 3, this band being moulded integrally with the end-plate of the cap 1, from which it is separated by a narrow circular slit 4 and to which it is attached by narrow webs of material 5. The retaining band 3, which is at least approximately of the same thickness as the end-plate 1 of the cap which it surrounds axially, may be formed in the same plane as the end-plate as shown in Figures 1 and 2 of the drawings. As illustrated in Figure 4, it may also project above the end-plate of the cap, its internal edge and the peripheral edge of the end-plate of the cap being to a certain extent chamfered, to facilitate engagement of the retaining band 3 around the skirt 2 of the cap during the capping operation as described below.

As shown by the various Figures in the attached drawing, the retaining band 3 itself consists of two co-axial rings 31 and 32 joined together by a solid area over part of their circumference (limited in the drawings to an arc of approximately 90°) and otherwise separated by a narrow circular slit 6. This novel concept of the retaining band 3 makes it possible to use a part thereof, namely the outer ring 32, as a grip loop by simply raising it above the common plane (Figure 3), without affecting the retaining pressure exerted on the sections of the skirt 2 of the cap by the inner ring 31. The two rings 31 and 32 are preferably also joined together by narrow webs of material 7 distributed along the circular separation slit 6, it being necessary to tear these webs of material 7 to lift the outer ring 32, thus providing evidence as to whether or not the cap has been removed.

The drawing also shows the presence of a circular groove 8 (Figures 2 and 4) adjacent to the extremity of the various sections of the skirt 2 of the cap. This groove is intended to receive and hold the retaining band 3 during the capping operation, as described below. The depth of the groove 8 must be sufficient to ensure positive location of the retaining band 3 to prevent accidental disengagement. The diameter at the bottom of the groove when the sections of skirt 2 are pressed against the external wall of the opening to be sealed must moreover be chosen slightly greater than the internal diameter of the ring 31 which constitutes the effective locking element of the band 3; in this way, the ring 31 is held expanded and exerts a positive locking force on the sections of the skirt 2 such that it cannot be removed without the exertion of considerable tractive effort on the outer ring 32, which must first be raised as shown in Figure 3.

The procedure for using the cap according to the invention may be easily understood in the light of the preceding description and

from the drawing.

In the capping operation, the location of the cap on the opening to be sealed, in this case of outlet 9, is easily effected by simple axial movement until the end-plate 1 of the cap abuts against the terminal face of the outlet connection 9 (Figure 4); the various sections of the skirt 2 of the cap are then loosely surrounding the threaded or ribbed external wall of the orifice. Axial pressure exerted on the retaining band assembly 3 is then sufficient to tear the webs of material 5 which attach it to the end-plate of the cap and to move it axially along the sections of the skirt 2 which it presses radially against the external wall of outlet 9, itself expanding as it progresses. On completion of this translatory motion, the retaining band engages in groove 8 which positively locates the band when the cap is in its locked position. It will be clear that these different operations can be simply effected by a single pass of a cap-fitting tool (not represented) working at high speed.

To remove the cap, the consumer need only exert sufficient axial traction on the outer ring 32 to tear the webs of material 7 so that this ring can be raised above the common plane. Upon completion of this operation, which does not require the use of any special tool, the consumer can insert a finger into the grip loop thus formed by the ring 32 and then with exert sufficient traction on the ring 31 to cause it to disengage from groove 8. The various sections of the skirt 2 of the cap then spring away from the external wall of the opening 9 and the cap can be removed without further effort. It should be noted that the retaining band 3 may, if necessary, be re-used later; nevertheless, the breakage of the webs of material 7 serves as evidence that the cap has been removed, which provides a commercial guarantee that the contents remain intact.

The end-plate 1 of one form of cap according to the invention is provided, as shown in Figure 4 with a central boss 10 which is approximately in the shape of a spherical dome, the diameter of the base of which corresponds closely to the internal diameter of the opening to be sealed. This boss plays a double role: in the first place it assures self-centering of the cap with respect to the axis of the opening during the location of the cap which precedes the cap-fitting operation proper; if the outlet of the opening is fitted with an elastic sealing ring or sleeve 12, it also serves to improve the tightness of the seal by slightly compressing the terminal face of the said ring or sleeve.

The end-plate of the cap in the alternative form according to the invention, as shown in Figure 5, includes an axial projection 11 of tubular shape which, when the cap is fitted, is pressed inside the opening 9 beyond the

elastic sealing sleeve 12 with which this opening is provided. This provides a seal at the relatively high internal pressures generally encountered with containers liquefied petroleum gas.

#### WHAT WE CLAIM IS:-

1. A safety and guarantee cap of elastic, thermoplastic material suitable for providing or completing the closure of a container for a liquid and/or gas under pressure for example, said cap consisting of a solid end-plate adapted to abut against the terminal surface of the opening to be sealed, a split-flared skirt which projects from this end-plate and is adapted to surround the external wall of said opening, its internal surface being formed to fit the shape of said wall, and a retaining band which is adapted to slide axially along the skirt and to hold the various sections of the skirt elastically and radially pressed against said wall, wherein

(1) the retaining band is moulded integrally with the end plate of the cap, to which it is attached by narrow webs of material defining a plurality of circumferential slits between the end-plate and the band, whereby said retaining band can be detached from said end-plate by tearing the webs by movement of a fitting tool, and

(2) the internal surface of the end-plate of the cap, in relation to the container opening, is provided either with a central boss approximately in the shape of a spherical dome, the diameter of the base of which corresponds substantially to the internal diameter of the opening to be sealed, or with an axial projection of tubular shape which is adapted to enter the opening to be sealed.

2. A cap as claimed in claim 1, wherein the retaining band is formed co-axially in the same plane as the end-plate of the cap and is of approximately the same thickness as said end-plate.

3. A cap as claimed in claim 1, wherein the retaining band is formed co-axially projecting above the end-plate of the cap, in relation to the container opening, and is of approximately the same thickness as said end-plate.

4. A cap as claimed in claim 3, wherein the peripheral edge of the end-plate of the cap and the internal surface of the retaining band are chamfered.

5. A cap as claimed in any one of the preceding claims, wherein the retaining band is adapted to move axially to engage in a groove provided adjacent to the extremity of the skirt, the depth of said groove being sufficient to ensure positive location of said band therein.

6. A cap as claimed in any one of the preceding claims, wherein the retaining band consists of two coaxial rings joined together by a solid area over part of the circumference and otherwise separated by an interrupted

partially circular slit such that the outer ring can be raised above the common plane to serve as a grip loop.

- 5 7. A cap as claimed in claim 6, wherein the two rings constituting the retaining band are further joined together by one or more webs of material distributed along the partially circular separation slit, it being necessary to tear the said web or webs of material in order to lift the outer ring.

- 15 8. A cap as claimed in any one of the preceding claims, wherein the skirt is provided with circular ribs or similar projections in patterns adapted to match the external profile of the valve outlet connec-

tion of a bottle for liquefied petroleum gas.

9. A cap as claimed in claim 1 and substantially as hereinbefore described with reference to Figures 1 to 3, and either Figure 4 or Figure 5 of the accompanying drawings. 20

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FIG. 1

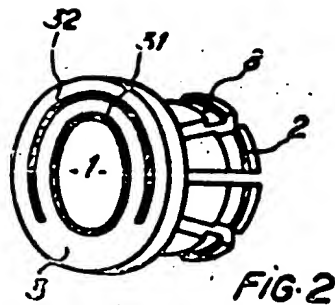
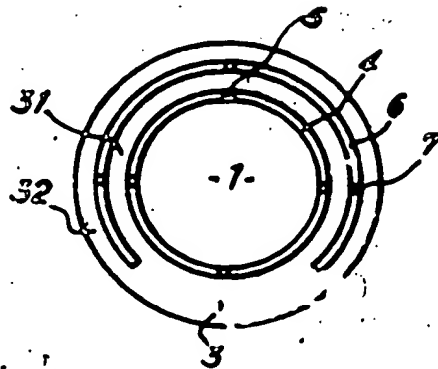


FIG. 3

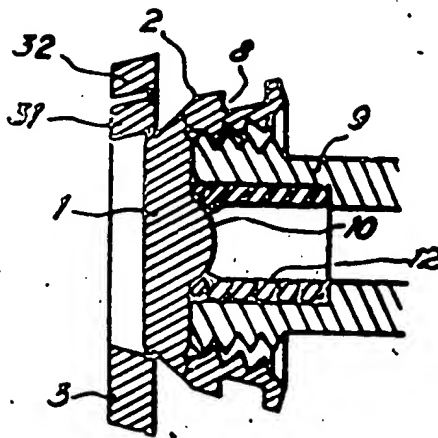
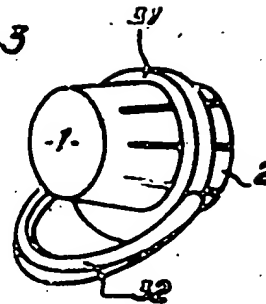


FIG. 4

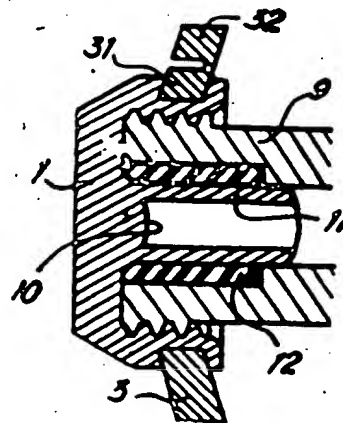


FIG. 5